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ZHE, MENG YAO				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary

Application No.

10/677,159

Applicant(s)

LOWELL, DAVID E.

Examiner

MENG YAO ZHE

Art Unit

2195

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 August 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-67 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/CD)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-67 are presented for examination.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 13-27, 56-67 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The step of virtualization is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). A memory has to be virtualized before it can be devirtualized.
3. Claims 1-12, 28-55 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. While the specification describes what happens when virtualization is being performed, the specification only mentions commencing virtualization but does not describe what steps are involved in the act of "commencing virtualization".

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-67 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. The claim languages in the following claim languages are unclear and indefinite:

i) Claim 1, it is uncertain exactly what happens to the system when virtualization commences <i.e. what step is actually performed to commence virtualization? What happens during the commencing of virtualization? The Examiner has interpreted the claim to mean that virtualization is performed multiple times. And that the act of VMM trapping the proposed translation made by the VM and gives it a different translation is one example of virtualization.>

Claims 28, 36, 44 have the same deficiencies as claim 1 above.

ii) Claim 13, it is uncertain how the devirtualization happened without any virtualization step <i.e. was the memory virtualized to begin with?>.

Claim 56 has the same deficiency as above.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 1, 28, 36 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of Patent Application No. 10/676922 (hereafter Lowell) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

7. As per claim 1 of this application and claim 1 of Lowell, they both teach Virtual machine monitor that commences virtualization at runtime.

The only difference between this application and Lowell is that this application teaches virtualization of memory whereas Lowell teaches virtualization of I/O devices.

However, it would have been obvious to one having ordinary skill in the art of virtual machines to see that the virtual machine monitor is capable of both virtualizing the memory and the I/O devices at the time of the applicant's invention since both are important features of a virtual machine monitor as proved and taught in Bean, for the purpose of providing the illusion to a guest virtual machine running on top of a virtual machine monitor that it has sole control of the computer resources thus allowing multiple guests to run on one single computer (Column 1, lines 26-43; Column 2, lines 25-45).

Therefore, it would have been obvious to one of an ordinary skill in the art at the time the invention was made to have the virtual machine monitor virtualize anything included in its capabilities, which includes memory and I/O devices.

As per claims 28, 36, they are rejected for the same reasoning as above.

8. Claims 13, 56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 17 of Patent Application No. 10/676922 (hereafter Lowell) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

The reasons for rejection is the same as rejection of claim 1 above.

9. Claims 1, 28, 36 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of Patent Application No. 10/676557 (hereafter HP) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

10. As per claim 1 of this application and claim 52 of HP, they both teach a Virtual machine monitor that performs virtualization at runtime.

The only difference between this application and HP is that this application teaches virtualization of memory whereas HP teaches virtualization of hardware.

However, it would have been obvious to one having ordinary skill in the art at the time of the applicant's invention that memory is a specific type of hardware and that a

virtual machine monitor has the capability of virtualizing hardware that includes memory, as taught by Bean, for the purpose of allowing multiple guest virtual machines to run on a single computer (Column 1, lines 26-43; Column 2, lines 25-45).

Therefore, it would have been obvious to one of an ordinary skill in the art at the time the invention was made to have the virtual machine monitor virtualize any hardware included in its capabilities, which includes memory.

Claims 28, 36 are rejected with the same reasoning as claim 1 above.

11. Claims 13, 56 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 62 of Patent Application No. 10/676557 (hereafter HP) in view of Bean et al., Patent No. 4,843,541 (hereafter Bean) . Although the conflicting claims are not identical, they are not patentably distinct from each other because both methods comprise substantially the same elements.

The reasons for rejection are the same as claim 1 above.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. Claims 1-2, 4-5, 10, 12-19, 25, 27-30, 35-38, 42-43, 55-62, 67 are rejected under 35 U.S.C. 102(b) as being anticipated by Bean et al., Patent No. 4,843,541 (hereafter Bean).

13. Bean was cited in the previous office action.

14. As per claims 13, 56, Bean teaches a method of running a virtual machine monitor on computer hardware and an operating system on the virtual machine monitor, the hardware including memory, the memory virtualized by the virtual machine monitor, the method comprising devirtualizing the memory at runtime of an operating system (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that were originally mapped to a virtual machine guest and is later remapped to the host is considered from being virtualized to being devirtualized, since the host uses real addresses while the virtual machine uses virtual addresses. Column 1, lines 50-58; Column 2, lines 1-11: the part of memory under direct control of the guest operating system corresponds to devirtualized memory since it does not need the VMM or VM host to translate it).

15. As per claims 14, 57, Bean teaches wherein a portion of the memory is devirtualized (Column 1, lines 50-58; Column 2, lines 1-11; Column 22, lines 47-55).

16. As per claims 15, 58, Bean teaches wherein when the operating system is booted, the virtual machine monitor exposes the booting operating system to physical

memory no larger than machine memory, where the physical memory does not span any memory holes (Column 1, lines 55-58: for a V=R guest, the virtual address correspond directly to the real address, therefore it can't be larger than the machine memory.).

17. As per claims 16, 59, Bean teaches wherein the operating system defines virtual-to-physical translations prior to the runtime devirtualization (Column 30, lines 5-8); wherein the virtual machine monitor defines physical-to-machine translations prior to the runtime devirtualization (Column 29, lines 30-45); wherein the virtual machine monitor composes dynamically the virtual-to-physical translations with the physical-to-machine translations prior to the runtime devirtualization, wherein the runtime devirtualization includes having the virtual machine monitor cease to perform the dynamic composition of translations (Column 22, lines 47-55; Column 29, lines 33-55: when the memory resource is assigned to a guest, composite translation is necessary, however, when it gets assigned to the host, that memory is devirtualized, and translation is no longer necessary.).

18. As per claims 17, 60, Bean teaches wherein the devirtualization includes remapping physical memory so a physical-to-machine mapping becomes an Identity mapping; and using the operating system to manage address translation with respect to the devirtualized memory (Column 29, lines 45-50; Column 30, lines 5-8).

19. As per claims 18, 61, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of

physical memory are remapped directly (Column 22, lines 47-55; Column 29, lines 33-55: memory resources that are already part of the host do not need to be remapped, only the memory that originally belonged to a guest needs to be remapped.).

20. As per claims 19, 62, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped indirectly (Column 2, lines 30-40; Column 22, lines 47-55; Column 29, lines 33-55).

21. As per claim 1, Bean teaches a method of running a virtual machine monitor on computer hardware, the hardware including memory, the method comprising commencing virtualization memory at multiple times during runtime of an operating system (Column 2, lines 25-40; Column 22, lines 47-55; Column 29, lines 35-50).

22. As per claim 2, Bean teaches wherein the virtualization includes constructing an Identity mapping of physical to machine memory (Column 28, lines 33-41; Column 29, lines 35-50: Guest real address corresponds to physical memory, host absolute address corresponds to machine memory); and commencing to use the virtual machine monitor at runtime to manage memory translation (Column 2, lines 28-40: VM host corresponds to virtual machine monitor).

23. As per claim 4, Bean teaches wherein the memory translation is initially performed according to the Identity mapping (Column 29, lines 35-50).

24. As per claim 5, Bean teaches wherein the virtual machine monitor modifies the mapping after the physical memory has been virtualized (Column 22, lines 46-55).

25. As per claim 10, Bean teaches wherein only a portion of physical memory is virtualized at runtime (Column 22, lines 47-55: some memory resource may belong to host only, instead of guest and is hence not virtualized).

26. As per claim 12, Bean teaches performing runtime devirtualization of the virtualized memory (Column 22, lines 47-55).

27. As per claim 25, Bean teaches wherein the remapping is performed without a back map by constructing a list of the physical pages mapping to a page of machine memory by searching the physical-to-machine mapping (Column 29, lines 35-50).

28. As per claims 27, 55, 67, Bean teaches wherein managing the address translation includes having the virtual machine monitor cease to compose dynamically the operating system's virtual-to-physical translations with the virtual machine monitor's physical-to-machine translations for a portion of physical memory that is devirtualized (Column 22, lines 47-55; Column 29, lines 33-55: it is inherent that once the memory is devirtualized, the composite translation no longer occurs.).

29. As per claims 28, 36, Bean teaches a computer comprising memory including first and second portions, the first portion encoded with a virtual machine monitor that commences virtualization of the second portion multiple times during runtime of an operating system (Column 2, lines 30-40; Column 22, lines 47-55; Column 29, lines 33-55).

30. As per claims 29, 37, Bean teaches wherein the virtualization includes constructing an Identity mapping of physical to machine memory; and commencing to

use the virtual machine monitor at runtime to manage memory translation (Column 29, lines 45-48).

31. As per claims 30, 38, Bean teaches wherein the virtual machine monitor modifies the mapping after the physical memory has been virtualized (Column 22, lines 47-55).

32. As per claims 35, 43, Bean teaches wherein only a portion of physical memory is virtualized at runtime (Column 22, lines 47-55: those memory resources belonging to the host is not virtualized.).

33. As per claim 42, Bean teaches wherein a translation lookaside buffer is loaded with the virtual-to-machine translations (Column 30, lines 20-25).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

34. Claims 6-9, 11, 26, 31-34, 39-41, 44-50, 54, 66, are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean).

35. As per claims 6, 31, 39, Bean teaches wherein the memory translation is managed by allowing the operating system to define virtual-to-physical mapping

(Column 30, lines 3-8), and the virtual machine monitor to define physical-to machine mapping (Column 29, lines 44-50).

Bean does not specifically teach wherein an operating system is running on the virtual machine monitor prior to virtualizing the memory. However, since initializing the virtual machine monitor with its running operating system before setting any other guest virtual machines on top of the virtual machine monitor is generally well known in the field of virtual machines, it would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to allow the operating system for virtual machine monitor to run prior to virtualization of the memory.

36. As per claim 7, Bean teaches wherein the virtual machine monitor dynamically composes virtual-to-physical translations with physical-to-machine translations (Column 6, lines 35-50).

37. As per claim 8, Bean teaches wherein the virtual machine monitor inspects the virtual-to-physical mappings by the operating system and maintains page tables of virtual-to-machine mappings (Column 29, lines 35-50).

38. As per claim 9, Bean teaches loading a translation lookaside buffer with virtual-to-machine translations (Column 30, lines 20-25).

39. As per claim 11, Bean teaches virtualizing both the CPU and the memory (Column 22, lines 61-68). However, Bean does not specifically teach that the CPU must be virtualized prior to the virtualization of the memory. However, since the order of hardware virtualization does not matter in the field of virtual machines, it would have

been obvious to one having ordinary skill in the art to virtualize all hardware in any preferred order, including CPU before memory.

40. As per claims 32, 40, Bean teaches wherein the virtual machine monitor dynamically composes virtual-to-physical translations with the physical-to-machine translations (Column 29, lines 35-55).

41. As per claims 33, 41, Bean teaches wherein the virtual machine monitor inspects the virtual-to-physical mappings by the operating system and maintains page tables of virtual-to-machine mappings (Column 29, lines 35-55).

42. As per claims 34, Bean teaches wherein a translation lookaside buffer is loaded with the virtual-to-machine translations (Column 30, lines 20-25).

43. As per claims 26, 54, 66, Bean does not specifically teach wherein managing the address translation includes having the virtual machine monitor cease to inspect the operating system's virtual-to-physical translations; and ceasing to maintain a page table of direct virtual-to-machine mappings. However, Bean teaches assigning memory from a guest to a host, therefor devirtualizing the memory that was originally intended for the guest (Column 22, lines 47-55). It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention that the composite translation will stop since that memory no longer belongs to the guest that needs virtual memory.

44. As per claim 44, Bean teaches a method of running a virtual machine monitor on computer hardware and an operating system on the virtual machine monitor, the

hardware including memory, the memory virtualized by the virtual machine monitor, the method comprising VMM commences virtualization of the memory when multiple operating system instances are running (Column 1, lines 45-65; Column 2, lines 30-40; Column 22, lines 47-55; Column 29, lines 35-50) and devirtualizing the memory at runtime (Column 2, lines 30-40; Column 22, lines 47-55; Column 29, lines 33-55: memory resources that were originally mapped to a virtual machine guest and is later remapped to the host is considered from being virtualized to being devirtualized, since the host uses real addresses while the virtual machine uses virtual addresses; Column 1, lines 50-58; Column 2, lines 1-11).

Bean does not specifically state devirtualizes the memory when a single operating system instance is running.

However, Bean teaches, in column 8, line 24; Column 9, line 63-65; Column 22, lines 47-55; Column 29, lines 33-55, that under the specific circumstance when one guest out of two guests is terminated, and its memory gets reassigned to the host, there is only one guest with its OS that is running. Therefore, devirtualization occurs though this reassignment of memory.

45. As per claim 45, Bean teaches wherein a portion of the memory is devirtualized (Column 22, lines 47-55).

46. As per claim 46, Bean teaches wherein when the operating system is booted, the virtual machine monitor exposes the booting operating system to physical memory no larger than machine memory, where the physical memory does not span any memory

holes (Column 1, lines 55-58: for a V=R guest, the virtual address correspond directly to the real address, therefore it can't be larger than the machine memory.).

47. As per claim 47, Bean teaches wherein the operating system defines virtual-to-physical translations prior to the runtime devirtualization (Column 30, lines 5-8); wherein the virtual machine monitor defines physical-to-machine translations prior to the runtime devirtualization (Column 29, lines 30-45); wherein the virtual machine monitor composes dynamically the virtual-to-physical translations with the physical-to-machine translations prior to the runtime devirtualization, wherein the runtime devirtualization includes having the virtual machine monitor cease to perform the dynamic composition of translations (Column 22, lines 47-55; Column 29, lines 33-55: when the memory resource is assigned to a guest, composite translation is necessary, however, when it gets assigned to the host, that memory is devirtualized, and translation is no longer necessary.).

48. As per claim 48, Bean teaches wherein the devirtualization includes remapping physical memory so a physical-to-machine mapping becomes an Identity mapping; and using the operating system to manage address translation with respect to the devirtualized memory (Column 29, lines 45-50; Column 30, lines 5-8).

49. As per claim 49, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped directly (Column 22, lines 47-55; Column 29, lines 33-

55: memory resources that are already part of the host do not need to be remapped, only the memory that originally belonged to a guest needs to be remapped.).

50. As per claim 50, Bean teaches wherein pages of physical memory that are already Identity-mapped are not remapped, and wherein at least some other pages of physical memory are remapped indirectly (Column 22, lines 47-55; Column 29, lines 33-55).

51. Claims 20-22, 51-53, 63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Chu, Patent No. 6,256,657 (hereafter Chu).

52. Chu was cited in the previous office action.

53. As per claims 20, 51, 63, Bean does not specifically teach wherein the remapping of the physical memory is performed concurrently with operating system and application activity.

However, Chu teaches operating system and related activities performs remapping, thus remapping occurs concurrently with operating systems for the purpose of having the operating system perform the job of remapping (Column 6, lines 56-67).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to combine the teachings of Bean with wherein the remapping of the physical memory is performed concurrently with operating system and application

activity, as taught by Chu, because it allows the operating system to perform remapping.

54. As per claims 21, 22, 52, 64, 53, 65, Chu teaches preventing the physical-to-machine mapping from being modified during the remapping, and temporarily preventing some or all write accesses to memory (Column 9, lines 60-Column 10, line 18).

55. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Waldspurger, Patent No. 6,789,156 (hereafter Waldspurger).

56. Waldspurger was cited in the previous office action.

57. As per claim 23, Bean does not specifically teach maintaining a back map that contains for each page of machine memory a list of the pages of physical memory that map to it, and a list of free machine pages.

However, Waldspurger teaches a back map for the purpose of identifying all the contexts that are sharing the same memory page, or in other words, all contexts that are mapped onto the same page. (Column 14, lines 17-24; Column 29, lines 27-28).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to combine the teachings of Bean with maintaining a back map, as taught by Waldspurger, because it allows the system to identify all contexts that are mapped to the same page.

58. As per claim 24, Waldspurger teaches wherein the remapping is performed without a back map by maintaining a reference count for each machine page is kept, and freeing machine pages when their reference counts are zero (Column 14, lines 12-43; Column 20, lines 29-33).

59. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bean et al., Patent No. 4,843,541 (hereafter Bean) in view of Bugnion et al., Patent No. 6,296,847 (hereafter Bugnion).

60. Bugnion was cited in the previous office action.

61. As per claim 3, Bean does not specifically teach wherein mapping is constructed prior to runtime.

However, Bugnion teaches mapping may be constructed before the run time of virtual machine for the purpose of mapping restoration (Column 14, lines 50-55).

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention to modify the teachings of Bean with mapping is constructed prior to runtime, as taught by Bugnion, for the purpose of mapping restoration.

Response to Arguments

62. Applicant's arguments filed on 8/20/2009 have been fully considered but are not persuasive.

63. In the remark, the applicant argued that:

i) Bean does not teach devirtualizing the memory at run time, instead it merely teaches reassigning resources.

64. The Examiner respectfully disagrees with the applicant. As to point:

i) Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

However, the Examiner AGAIN notes the following. The applicants is advised to read the following statements and interpretation before continuing to argue that devirtualization is not being taught. The applicant never gave a specific, clear definition of what devirtualization is. Therefore, the Examiner has interpreted devirtualization of memory as any memory used by the virtual

machine guest that does not have to go through the VMM for translation or any memory that does not belong to the virtual machine guest, since this kind of memory does not need to be translated and virtualized. Bean clearly teaches this in Column 1, lines 50-58; Column 2, lines 1-11.

Furthermore, as another example of devirtualization, it is exactly the reassignment and remapping of resources that teaches the limitation of devirtualization. In column 22, lines 47-55; Column 29, lines 33-55, resources, which include memory, get reassigned from guest to host. When memory was assigned to be used by guests, there is an extra step of virtualizing that memory in order to provide the illusion to the guest that it is in control of all of the computer's memory, or at least that it has more than what it actually has (see Fig 7A). However, when that memory gets remapped from the guest back to the host, the virtualization is removed, or devirtualized, because the host does not need that illusion because it needs to know the real memory address in order to run itself. The Examiner notes that even in the specification when devirtualization is described, memory is merely being remapped during the process of devirtualization.

Conclusion

65. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MENGYAO ZHE whose telephone number is (571)272-6946. The examiner can normally be reached on Monday Through Friday, 7:30 - 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Meng-Ai An/
Supervisory Patent Examiner, Art Unit 2195

/MengYao Zhe/